

[0005] In the optical engine application of the prior art, where high power light bulbs are

used as the light source for projection, apart from the high heat of the light bulb as the light source that needs to cool, the first lens array 12 that gets the projection first also experiences an increase in temperature, as it takes most heat energy. When the projection temperature raise to the limitation, due to the ultraviolet-infrared cutter (UV-IR cutter) 121 and the lens array 12 are made from different materials, and thus having different coefficients of expansion, the layer of ultraviolet-infrared cutter (UV-IR cutter) 121 and the lens array 12 will be stripped off forming an interstice and affects optical quality. In addition, the light beam received by the second lens array 14, despite having been filtered through the UV-IR cutter 121 on the first lens array 12, still carries a fairly large amount of heat energy from the visible light beams, The layer of UV-IR cutter 141 on the second lens array 14 will also be stripped off when the temperature raises to the limitation. This stripping problem also affects the polarizing film 151 of the polarization system 15. Furthermore, high temperature also affects the optical quality of all the optical components in the imaging system 20. However, since the characteristics of the present invention are limited to the illumination system 10, the cooling of the imaging system 20 is not described within the present invention, wherein the imaging system is not limited to the penetrated type of light valve system, and can also include the reflective type of light valve system.

[0006] In the projection display of the prior art, in order to lower the temperature of the illumination system, which installing cooling fans, respectively, at the locations of the light source 11, the first lens array 12, the second lens array 14, and the polarization systems 15. There are also some apparatus of the prior art using a larger cooling fan for cooling the light source 11 and the first lens array 12, at the same time, while using another smaller fan for cooling the second lens array 14 that is located farther away from the light source 11. Nevertheless, both of these two methods require the use of multiple sets of fans, not only increasing cost and noise, but also increasing the difficulty in system control, to such an extent that the it lowers the reliability of the system, while affecting the quality of the products.

Summary of Invention

[0007]

The object of the present invention is to provide a cooling apparatus for

illumination system of optical engine, wherein only one single fan is applied in order to reduce noise and lower cost, while improving the reliability of the system operation.

[0008] The other object of the present invention is to provide a cooling apparatus for illumination system of optical engine according to the required cooling air of each component to arrange differentiated interstice of the air duct to effectively utilize the air flow from fan and improving the cooling efficiency of the fan.

[0009] To achieve the above-mentioned objectives, cooling apparatus for illumination system on optical engine of the present invention includes: an illumination system that has a lamp base for its light source, wherein the lamp base has an air duct body fixed on one side of it, wherein at least one partition separates the air duct body into a plurality of air ducts of different surface areas, and an outer air duct extends one of the air ducts from underneath the air duct body to outside of the air duct body, wherein a fan installed on the air duct body takes in air through each of the air ducts and the outer air duct to cool the illumination system, thus improving the cooling efficiency of the fans, while reducing the volume of cooling air needed from the fans, lowering the cost and reducing the noise from the fans.

Brief Description of Drawings

[0010] Figure 1 is a diagram illustrating the light path in the optical engine of the prior art.

[0011] Figure 2 is a perspective view illustrating the positional correlation between the cooling apparatus and the illumination system of the optical engine of the present invention.

[0012] Figure 3 is a perspective view illustrating the cooling apparatus of the present invention.

[0013] Figure 4 is a perspective view illustrating the air duct structure of the present invention.

Detailed Description

[0014]

Referring to the associated drawings, the embodiments of the present invention

[0016] As shown in Figure 4, the cross-section of the air duct body 32 is a framed body with its cross-section resembling a square. The air duct body 32 is separated into a main air duct 327 and an auxiliary air duct 328 by a main partition 322 spanning across the two sides of the air duct body 32. The surface area of the main air duct 327 is twice as large as that of the auxiliary air duct 328. Furthermore, the main air duct 327 is separated into a light source air duct 3271 and a lens air duct 3272 by a subsidiary partition 323 that spans across the main partition 322 and one side of the air duct body 32. The surface area of the light source air duct 3271 is three times as large as that of the lens air duct 3272. The auxiliary air duct 328 has a bottom plate 3281 sealing up the bottom side of auxiliary air duct 328, so as to gather the air flow to the air duct. An air guiding hole 331 is forming on one side of the bottom plate 3281, and a tubular external air duct 33 is jointed right underneath the air guiding hole 331. The external air duct 33 extends from underneath one corner of the air duct

body 32 unto the second lens array 14 installed near the exit of the lens framework 17. Additionally, the four corners of the air duct body 32 are set up with a protruding position pin 325 at the corner located diagonally across from the external air duct 33, two fastening slots 324 and 326 are set up at the other two diagonal corners corresponding to the pair of position holes 313 and 315, and the pair of fastening holes 314 and 316 are set up on the four corners of the fan 31. By means of screws and bolts (not shown in drawing) inserted into the position holes 313 and 315, and fastened with fastening holes 324 and 326, the fan 31 can then be fixed onto the air duct body 32.

[0017]

The present invention of the cooling apparatus for illumination system of optical engine uses a fan 31 to draw air from the outside, and blow into the air duct body 32 which is installed underneath the fan 31. The air duct body 32 guides the air to locations requiring cooling by the air ducts which are of different surface areas. The light source air duct 3271 guides most of the air into the light bulb as the light source 11 inside the lamp base 111, and the lens air duct 3272 guides part of the air, from the adjoining opening where the lamp base 111 and the lens framework 17 meet each other at the exit of the lens air duct 3272 to the illumination system 10, and then onto the first lens array 12 to cool. Furthermore, the auxiliary air duct 328 gathers the air into the air guiding hole 331 by the bottom plate 3281. The bottom plate 3281 guides the air flow into the external air duct 33, along with the guiding of the outer air duct 33, then unto where the exit of the lens framework 17 is, to cool the second lens array 14 and the polarization system 15 that are located farther along. Although the surface of the auxiliary air duct 328 is larger than the surface of the lens air duct 3272, the auxiliary air duct 328, is not carrying larger cooling air flow than the lens air duct 3272. The auxiliary air duct 328 has longer guiding distance and more turns of the flow direction, causing more loss in mobility than the lens air duct 3272. As the present invention of the cooling apparatus for illumination system of optical engine has taken into consideration the different amounts of cooling air needed by each location, the air duct body 32 is partitioned into air ducts of different surface areas, and an appropriate amount of air is respectively delivered to locations in need of cooling, thus allowing the amount of air coming out of the fan 31 to be fully utilized, while effectively improving the cooling efficiency of the fan. Therefore, with only one

fan being applied, the cooling function of the illumination system can be fulfilled, while the amount of usage of the fan is reduced; not only does this save on cost, the noise of the fan is reduced, as well.

[0018] What is described above is to facilitate the description of the preferred embodiments of the present invention; the present invention is not limited to the above-mentioned embodiments. Any variations made according to the invention in any way to the details of the present invention may be possible as needed without departing from the scope of the invention. Additionally, the cooling apparatus of the present invention partitions an air duct body into air ducts of different surface areas. This helps to improve the cooling efficiency of the fan and reduce the amount of fan usage, not only saving on cost but also reducing the amount of noise produced by the fan.

[0019] It should be noted that the above-mentioned embodiments illustrate rather than limit the invention, and that those skilled in the art will be able to design many alternative solutions without departing from the scope of the claims.